EPA COMMENTS ON MAY 4, 2010 QEAFATE MODEL PRESENTATION
MAY 18, 2010

EPA Comments and Direction on How to Proceed:

EPA is providing the following set of comments and questions that must be discussed before we can provide the approval to proceed with the QEAFate modeling approach as presented during our meeting on May 4, 2010. Due to the detailed nature of some of these comments and questions, EPA recommends a small follow-up meeting between the LWG modelers and the members of the EPA project team responsible for reviewing the Portland Harbor fate and transport model in order to get down to the fine details of their model and modeling procedures.

Although EPA is prepared to provide the go ahead for the modeling approach, EPA expects model results to have significant uncertainty no matter how good the calibration and validation is. As a result of this uncertainty, the model should be used in the FS in a comparative manner (i.e., evaluate the long term contaminant reductions for one alternative in comparison to another) and that the model results represent one line of evidence in the evaluation of monitored natural recovery at the Portland Harbor site and that other information such as grain size distributions, empirical measurements of bathymetric change, and any observed reductions in contaminant concentrations over the life of the project will also be considered.

Model Calibration:

The following information is needed to evaluate the adequacy of the model calibration. This information will assist EPA in deciding if the model is simulating the various physio-chemical processes correctly.

1. Plots of the average concentrations of the simulated contaminants over the top 15 cm of the sediment bed (in addition to those over the top 30 cm presented during the May 4, 2010 meeting) since that is most likely the concentration values that will be used in the food web modeling.

2. Plots that show longitudinal and lateral (e.g., at select cross-sections) time series of concentrations over a multiple day period that includes a high flow event. This should be accompanied by a sufficiently detailed write-up that describes the simulated event and the model response over the course of the event (see attached figure).

3. Explain how measured concentrations of contaminants in the sediment (particulate, DOC complexed, and freely dissolved phases) were used in calibrating the model.

4. Results from a process-based global mass balance analysis performed on a multi-year model run for each of the contaminants modeled. See the figure on the last page for an example of this type of analysis that was performed for a reach of the Housatonic River, MA.

Additional Considerations:

1. Contaminant transport and fate model performance is best gauged by dynamic responses during high flow events and during base-flow as well rather than by long term temporal averages.

2. Validation of the model was not discussed in detail during the May 4, 2010 meeting. The model will need to be validated before it is used to make multi-decade model runs to evaluate various proposed remedies. The validation strategy should be presented to EPA for review and comment.

3. It is unclear what time period the model output concentrations will be averaged over for the food web model. A range of averages (hourly to daily) should be provided to understand how much variation is occurring due to the influence of the tide in the lower reach of the Lower Willamette.

4. EPA is concerned that the model calibration was based on the water data but the predicted reductions in sediment concentrations over the calibration period do not match up with what we observe in the sediment bed. This is clearly evidenced by looking at the scatter plots of sediment concentration vs. time and through consideration of key source areas at the site where contaminant concentrations remain high despite being released 30 – 50 years ago. The predicted water concentrations show a sharp, short-term increase in response to high flow events. This is not consistent with the surface water data collected during high flow events which actually see a decline in contaminant concentrations (although perhaps over a longer time scale than is predicted by the model). Although EPA and the LWG agreed that we could not calibrate the model based on sediment because of spatial heterogeneity (in particular, we did not see any difference in paired sediment station concentrations whether the data were collected on the same day or 3000 days apart), further efforts to calibrate or validate the model using average sediment concentrations over time (e.g., 1 year) should be considered.

5. There are a number of processes that need to be modeled. For example, the predicted water concentrations show a sharp spike in response to high flow events. What happens to these contaminants? Are they removed from the system? Do they settle right down? What happens to the more highly contaminated sediments below the eroded layer? Are we properly accounting for the mixing of these contaminants with the surface layer? Are sedimentation rates being properly estimated?

6. Because the model is a two-dimensional model, the calibration assumes vertical mixing. However, based on surface water data collected at the site, near bottom surface water samples are expected to have higher contaminant concentrations. The model evaluation should consider the uncertainty associated with the use of a 2-dimensional model and whether there are ways to compensate for this assumption.

7. The model should be used to generate contaminant concentrations averaged over a ½ mile interval and divided laterally into two near shore areas and a channel area. Although smaller spatial scales may need to be evaluated, this should be performed as part of a recontamination analysis. For example, what is the recontamination potential associated with stormwater discharges to a small dredged area.

8. Please clarify the relative importance of groundwater flux vs. contaminant concentrations in the plume. Slides 186-188 indicate that contaminant concentrations of naphthalene are essentially irrelevant and the difference in chemical concentrations in surface water is due to changes in the groundwater flow rate. Slide 209 states that groundwater flow is insignificant and that groundwater concentrations are insignificant with the exception of naphthalene. Additional information regarding the estimate of flux calculations should be provided.

9. Many of the model runs show concentration decreases near the beginning of the simulation and then appear to approach a new steady state in the last few years of the simulation. This has not been observed in the existing data (i.e. over the calibration time period 2002-2008) and needs to be explained further or substantiated with additional data. Depending on whether the new steady state concentration is less than or greater than the RAL, this could either indicate that natural recovery works very fast and would be relied on for a significant part of the remedy, or that the concentration flat-lines above the RAL due to ongoing inputs and thus remediation should not yet be attempted until further source control is achieved. Longer model runs would help clarify whether there is actually a new steady state or if this is just the result of flow conditions or other factors specific to the years 2006-2008.

10. The observed contaminant concentration trajectory may represent overestimates in the model initial conditions, which gradually become less influential as other forcing functions have their effect. Or it could represent an over estimate of the biodegradation rate or some other contaminant removal parameter such that steady state conditions reflect only the ongoing lateral and upstream inputs. It may be possible to distinguish between these two possibilities by comparing the predicted 2008 concentrations to the model inputs for upstream and lateral loads (lateral would include groundwater and stormwater and NPDES). If the “steady state” number is close to that, then it’s probably case 2. Alternatively, we could look at the spatial coverage of the data set used to create the sediment bed initial conditions. Perhaps it’s biased towards suspected/known contaminated areas and it’s giving us an overly high initial value.

11. Data collection to support analysis of temporal trends was not done for the RI, but there may be sufficient spatial coverage at least for some of the chemicals (PAHs, for example). This would help clarify whether the “steady state” prediction is reasonable.

12. It is unclear why PCB 126 and TBT were chosen for the sensitivity analysis; the data are relatively sparse for both these chemicals. It's not clear why PCB 126 was used and not a homolog group, since that is what is being modeled. The lack of data in some areas can drive the SWAC and thus the initial conditions.

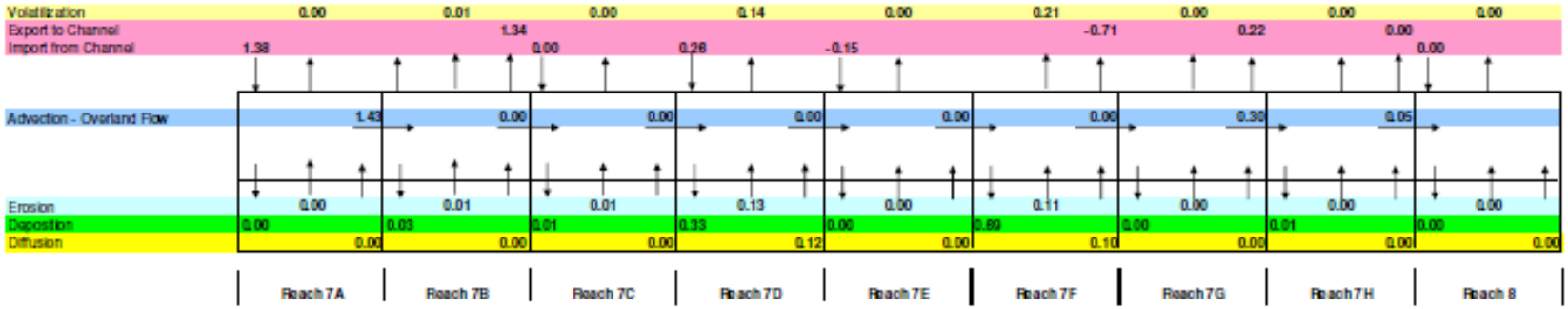
13. Water column animations were presented during the May 4, 2010 meeting. However, surface sediment animations should also be developed.

14. For metals, the model is under predicting water concentrations and over predicting sediment concentrations. This suggests a problem with the Kd used to partition the metals concentration.

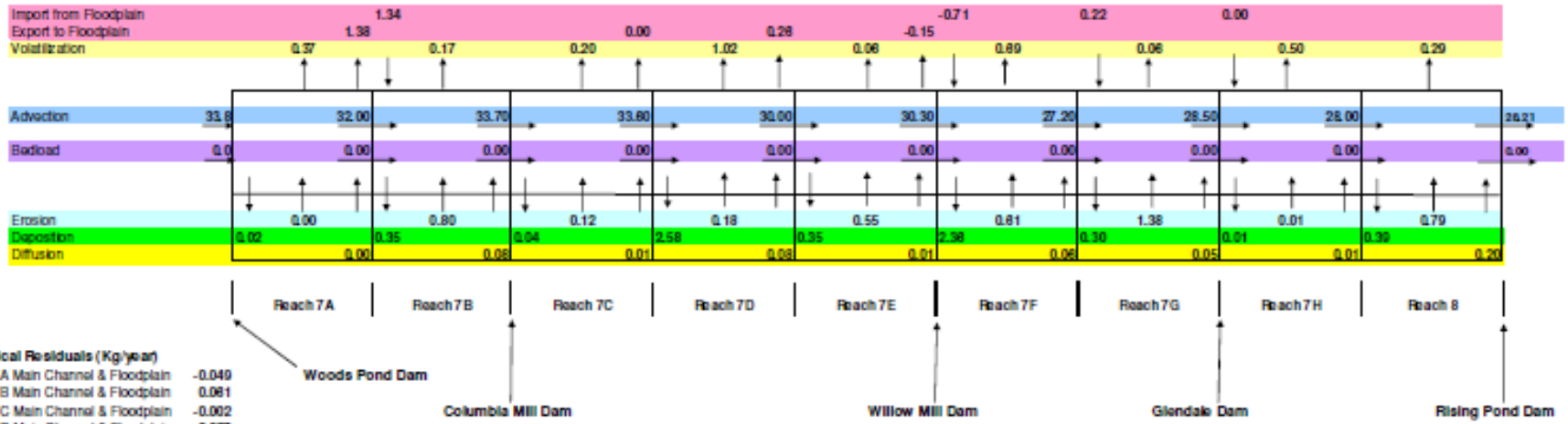
15. During the meeting, it was suggested that chemicals with "good" calibration be used to predict future contaminant concentrations and chemicals with "fair" calibration to evaluate comparatively. As we have stated previously, the goal of the model is to perform a comparative evaluation of remedial action alternatives in the FS. Further discussion is needed to understand how the predicted future sediment concentrations will be used in the remedy selection process.

PCB Mass Flux (Kg/year) Summary - Downstream Model Run (1990 - 2004)

Floodplain



Main Channel



Numerical Residuals (Kg/year)

Reach 7A Main Channel & Floodplain	-0.049
Reach 7B Main Channel & Floodplain	0.061
Reach 7C Main Channel & Floodplain	-0.002
Reach 7D Main Channel & Floodplain	0.027
Reach 7E Main Channel & Floodplain	-0.148
Reach 7F Main Channel & Floodplain	0.022
Reach 7G Main Channel & Floodplain	-0.518
Reach 7H Main Channel & Floodplain	0.237
Reach 8 Main Channel & Floodplain	0.153
Downstream Model Domain	-0.216